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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/804,610

03/18/2004

Yasuo Kitaoka

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06/22/2006

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EXAMINER

HO, TU TU V

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 06/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/804,610

Applicant(s)

KITAOKA ET AL.

Examiner

Tu-Tu Ho

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 30-47 is/are rejected.
- 7) ☒ Claim(s) 2-29 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 04/18/2006 has been entered.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. **Claims 1 and 30-47** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyajima et al. U.S. Patent 6,667,252 (the '252 reference, cited by Applicant) in view of Sarayama et al. U.S. Patent 6,592,663 (cited in a previous office action) or in view of Kawamura et al. "Growth of a Large GaN Single Crystal Using the Liquid Phase Epitaxy (LPE) Technique" (cited by Applicant).

Referring to **claims 1, 30, and 38**, the '252 reference discloses a method of manufacturing a Group III nitride substrate as claimed including causing a growth of Group III nitride crystals on a plurality of exposed portions of a Group III nitride semiconductor layer but

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does not teach a specific method as claimed for said growth. In particular, the '252 reference discloses in Figs. 1-2 and respective portions of the specification:

a method of manufacturing a Group III nitride substrate, comprising:

preparing a Group III nitride semiconductor layer (12, Figs. 1, cols. 1 and 2, particularly col. 2, lines 35-45) whose surface is partially exposed to provide a plurality of exposed portions (no number);

selecting the plurality of exposed portions as seed crystals for at least one of generation and growth of Group III nitride crystals (generally indicated at 13); and

causing the generation or the growth of the Group III nitride crystals on the plurality of exposed portions.

However, as noted above, the '252 reference does not teach that said generation or said growing is by, in an atmosphere including nitrogen, allowing a group III element and the nitrogen to react with each other in an alkaline metal melt while the plurality of exposed portions are in contact with the alkaline metal melt to cause said generation or said growth.

Nevertheless, Sarayama, in also disclosing a method of manufacturing a Group III nitride substrate including causing the generation or the growth of the Group III nitride crystals on a semiconductor layer (such as 701, Figs. 12-13) functioning as seed crystals, teaches that said generation or said growing is by, in an atmosphere including nitrogen (N, Fig. 12), allowing a group III element and the nitrogen to react with each other in an alkaline metal melt (102A, including Na, which is an alkali metal) while the exposed portion of the semiconductor layer that functions as seed crystals are in contact with the alkaline metal melt to cause said generation or said growth in order provide a novel device without problems in manufacturing

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processes encountered in prior art such as high temperature and high pressure (col. 3, lines 1-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '252 reference's semiconductor layer 12 that functions as seed crystals including said plurality of exposed portions as seed crystals using the generation or the growth of the Group III nitride crystals as taught by Sarayama. One would have been motivated to make such a change in view of the teachings in Sarayama that such a process results in a novel device without problems in manufacturing processes encountered in prior art such as high temperature and high pressure.

In a similar teachings, Kawamura discloses using pure nitrogen and an alkaline metal melt (Na flux, page 29, col. 1) to grow a GaN (Group III nitride) single crystal on a semiconductor GaN thin film so as to achieve high quality GaN single crystals without the high temperature and extremely high pressure of the prior art processes (page 29, col. 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '252 reference's semiconductor layer 12 that functions as seed crystals including said plurality of exposed portions as seed crystals using the generation or the growth of the Group III nitride crystals as taught by Kawamura. One would have been motivated to make such a change in view of the teachings in Kawamura that such a process results in high quality GaN single crystals without the high temperature and extremely high pressure of the prior art processes.

Referring to **claim 31**, the teachings further discloses that the atmosphere is a pressurized atmosphere (Sarayama ,column 5, lines 22-40; Kawamura, page 29, col. 2).

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Referring to **claim 32**, although the teachings fails to disclose that the melt further comprises alkaline-earth metal, alkaline-earth metal, similarly and in addition to alkali metal, has been used in the art to add to the melt, such as disclosed by D'Evelyn, paragraph [0037], therefore such addition would have been obvious to one of ordinary skill in the art.

Referring to **claim 33**, the teachings further discloses that the Group III nitride crystals are grown while the seed crystals is rocked in the melt (Sarayama, by motor 703).

Referring to **claims 34-37 and 38-42**, the '252 reference further discloses a semiconductor device (col. 1) similar to claim 38 utilizing the modified process as detailed above; for the limitations of claims 34-37 and 39-42, although the reference does not disclose specific cycles of exposed portions of seed crystals as claimed, the reference teaches a cycle equivalent in scope (col. 4, lines 1-14).

Referring to **claims 43-45**, as the claims are directed to a device, the limitations in the claims are product-by-process limitations and are considered non-limitation because the limitations do not appear to result in unexpected properties for the Group III nitride substrate. MPEP 2112.01 and MPEP 2113.

Referring to **claims 45-47**, the teachings further discloses that a semiconductor optoelectronic element, such as a laser diode or a light emitting diode, can be formed on the Group III nitride substrate (Sarayama, column 6, lines 1-8), and according to D'Evelyn, the Group III nitride substrate of semiconductor optoelectronic elements could comprise diamond-like carbon (carbide, paragraph [0003]), therefore such utilization of known and suitable material would have been obvious to one of ordinary skill in the art.

Allowable Subject Matter

3. Claims 2, 12, 18, 25, and respective independent claims, in view of the terminal disclaimer filed 02/17/2006, would be allowable if rewritten in independent form including all of the limitations of the respective base claim and any intervening claims.

The following is an examiner's statement of reasons for the indication of allowable subject matter: The cited art, whether taken singularly or in combination, especially when all limitations are considered within the claimed specific combination, fails to teach or render obvious a method of manufacturing a Group III nitride substrate having all exclusive limitations as recited in claims 2, 12, 18, and 25.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 7:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Tu-Tu Ho', with a horizontal line underneath.

Tu-Tu Ho
June 17, 2006